A Framing Primer

A Step-by-Step Guide to How It's *Supposed* to Be Done

by Marshall Gross

Framing is so simple that anyone can do it. But where are those few who have enough framing sense to do it *right*? All too often, the journeyman framer walks into a "completed" structure and spends the next two or three days finishing the job.

Here, then, is a step-by-step guide to framing a job the way it's *supposed* to be done—a framing "primer" of sorts for those just learning the ropes, and a refresher course for more experienced builders to help clear out the cobwebs just in time for the spring building rush.

Platform (or stick) framing involves seven distinct and well-defined steps: snapping lines, plating, making the cutting list, laying out the studs, framing, plumb-and-line work, and pickup. Follow this process in this order on all your jobs, and you'll save time, money and lots of needless headaches while building a sound structure.

Step 1: Snapping Lines

Step one begins the night before, when you do your homework. Look over the plans carefully, noting the overall dimensions of the building and the spacing of the wall partitions.

Pay special attention to the plumbing walls, the bathroom and kitchen floor plans and the elevation views. If the plumber has not located the pipe carefully, it can be quite a challenge relocating walls to conform to the plumbing while still leaving room for the cabinetry.

Look at the roof plan so you know which walls are load-bearing. Look at the elevation drawings and familiarize yourself with the siding. Read all the notes and specifications (contrary to popular belief, they aren't there simply to make the plans look thicker). I'd even recommend reviewing the site plan.

After the platform is up and you've done your homework, show up in the morning with a large broom and clean up the platform. The goal is to transform the chaos into order.

Think about the site plan and look at the platform. Are things correct? Is the platform square? Where are the most likely problem spots?

With the help of another worker, pick the largest exterior corners and check it for square by the 3-4-5 triangle method (remember your Pythagorean geometry?). These will be the master sides in laying out the other exterior walls.

From these two sides, measure across the platform in each direction and check dimensions against the floor plan. Check and compare dimensions to each side of all the plumbing as well. Once the actual and theoretical are compared, you can determine whether some adjustments in the wall layout are needed.

Don't forget to allow room for the exterior siding at the edge of the platform. Remember too that the roof already may be cut (or the trusses ordered), so there may be certain things that can't be changed. Picture the entire job and how it all fits together before you make any adjustments—don't just focus on one group of sticks.

Now you're ready to begin snapping lines. Snap only the interior line on all the perimeter walls, but snap both lines for all partition walls. Assuming 2x4 construction, have your partner hold the tape at the the 3½" line and mark the platform for the opposite exterior wall. Now two opposite exterior walls are laid out. Snap the other line along the master corner perpendicular to the first one.

Check your two master corner lines to ensure that you're at right angles. One way to get an idea is to lay your framing square

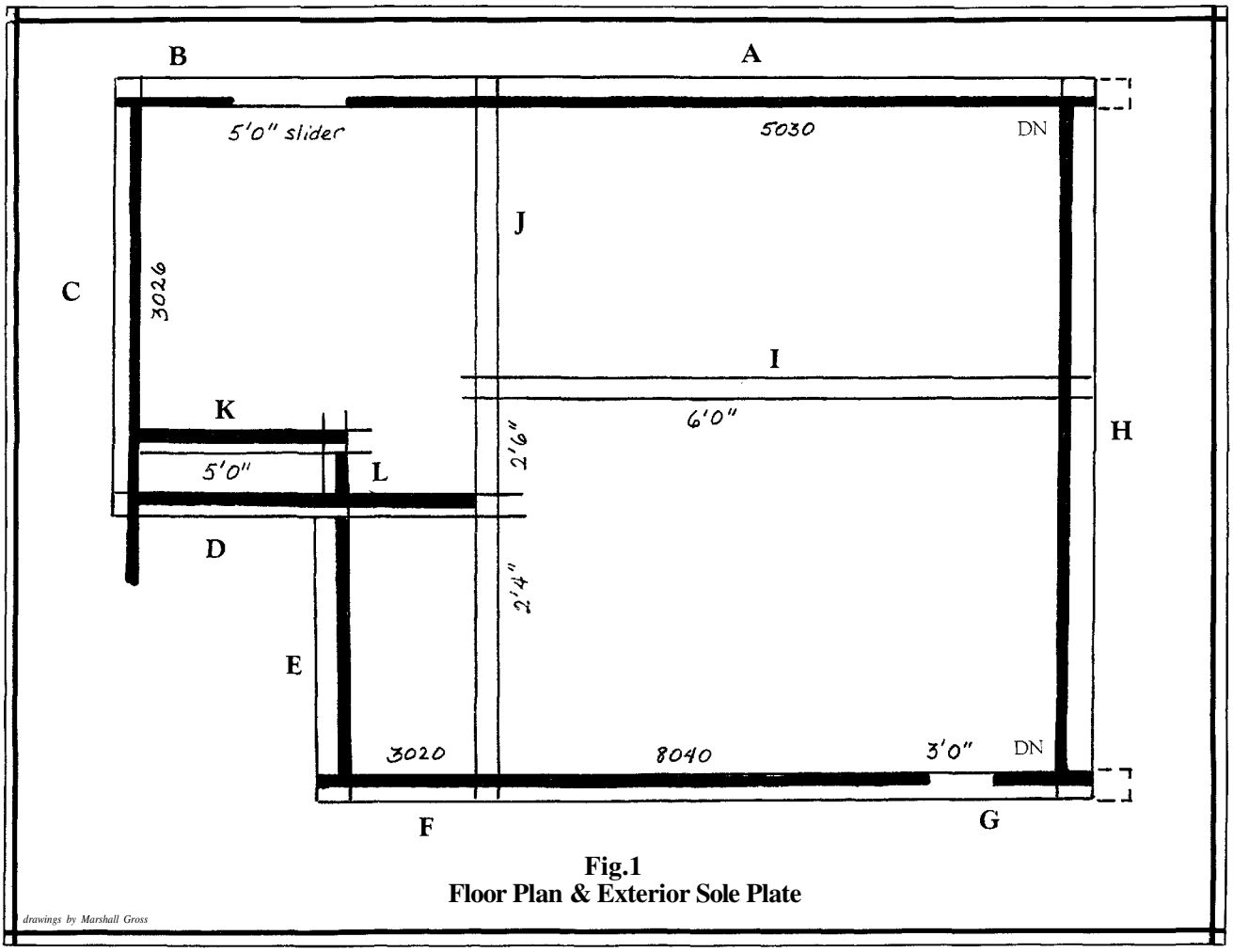


Fig.1
Floor Plan & Exterior Sole Plate

drawings by Marshall Gross

against the chalk lines and eyeball each line. A better way is to check by the 3-4-5 method.

Next, lay out the other exterior walls. Again, have your helper hold the tape at 3½" while you mark the inside plate line on the opposite side of the platform for that exterior wall.

Lay out all the exterior walls, then the plumbing walls. Add the rest of the snap lines for the remaining partitions. All interior snapped lines should overlap each other by six inches.

Finally, on the platform at each door and window opening, jot down the appropriate information for any special things you have with your lumber crayon (keel)—a 5'0" slider, a 2'8" door, a 5030 window, and a pocket door, for example.

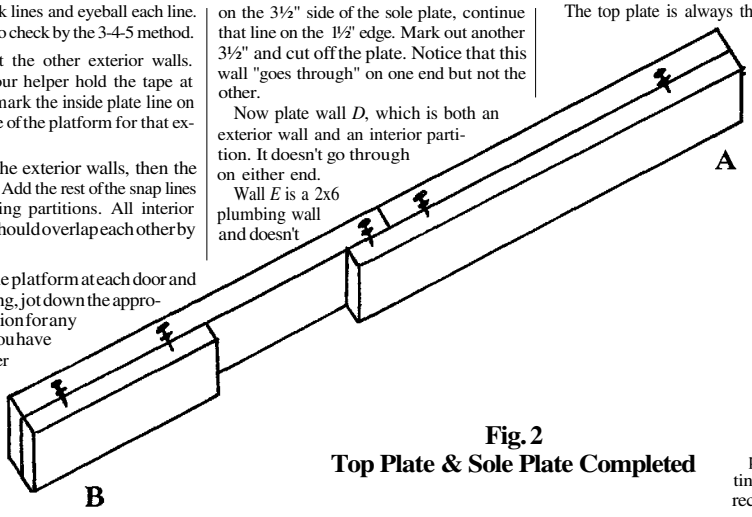


Fig. 2
Top Plate & Sole Plate Completed

At the completion of step one, you should have a single snap line around the entire perimeter, double chalk lines marking the location of interior walls, and notes on the platform indicating door and window sizes and any special components.

Step 2: Plating

Spread the sole-plate stock on the platform perimeter so that all exterior walls have a sole plate near them. It's not necessary to plate across door openings.

Plate the longest wall first (in this case, wall A-B in Fig. 1). Check one end of the sole plate to see that it is square and has no splits, then mark a line 3½" from the end. Move your combination square to continue the line on the 1½" surface.

Set the sole plate on edge with your 3½" chalk mark directly on the crossing point of the snapped line for wall *H*. (The darkened part of Fig. 1 shows the exterior sole plates on edge and along the snapped lines.)

In slab construction, where anchor bolts come through the sole plate, carefully mark each hole location from the snap line to the bolt and then from what will become the inside edge of the sole plate to the hole location. Drill the holes.

At this point, sole plates often have a way of getting turned over—which means that only the centered holes will fit when you raise the wall. If this happens, put a 2x4 on edge under the sole plate and redrill. If you're not used to keeping track of things, mark the inside (or outside) of the sole plate with your keel so you won't get it mixed up.

Lay out all the exterior walls, then the plumbing walls. Add the rest of the snap lines for the remaining partitions. All interior snapped lines should overlap each other by six inches.

If plumbing extends through the platform, you have to cut the sole plate to fit around it. Cut these holes very tight and make sure the plate is continuous on the outside or on the inside. There should be no open space across the plate. When laying out these cuts in the plate, you must visualize the completed wall and how it can be lifted past the plumbing into place.

Plate section *B* in the same manner. Use a convenient piece of plate stock that just fits into the space of the 5'0" slider.

Plate *C* is checked for square and placed directly on line against *B*. At the wild end draw a line on *C* directly at the perpendicular snap line of *D*. Each time you draw this line on the 3½" side of the sole plate, continue that line on the 1½" edge. Mark out another 3½" and cut off the plate. Notice that this wall "goes through" on one end but not the other.

Now plate wall *D*, which is both an exterior wall and an interior partition. It doesn't go through on either end.

Wall *E* is a 2x6 plumbing wall and doesn't go through on either end. It will be the last exterior wall to be framed. Its length is 3½" less than the measured distance between snap lines *D* and *F*.

Since *F* goes through (the longest walls should go through), it will need a line drawn on both the 3½" and 1½" faces. Set this mark directly where the snap lines cross. These lines on the plate are always made 3½" from the edge. (If your plate stock is wider, of course, use that width as the dimension.)

H is pretty simple to plate. It's done almost like *C*, but since it doesn't "go through," it will be cut off at the perpendicular snap line. Use the cut-off piece to form *G*.

The top plate is always the same overall length as the sole plate. At *A* and *B* or *F* and *G*, the top plate must cross the door opening and be broken directly over the center of a stud that is more than four feet from the end of the wall. The plate also may be broken over a solid header, but not over one with cripples. After cutting it to the correct length, place the top plate against the outside of the sole plate and toenail the individual plate sets together.

Use two or more nails (size 7d duplex) toenailed along the top edge. (Fig. 2 shows the *A-B* wall plate pieces toenailed together.)

Continue with the interior plates the same way. Wall *K* will receive a line on the 3½" and 1½" faces where the interior snap line from *L* crosses. The sole plates of *I* and *K* needn't be continuous, although it certainly wouldn't detract from anything.

You're finished plating when all of the plates shown in Fig. 2 are in place within the snap lines. Plate joints must be at least four feet apart and fall directly over a stud.

Step 3: The Cutting List

After you have studied the window and door schedule on the plans and actually measured the header stock on hand, you can make up a cutting list for all the odd wall-framing members. This includes header stock, trimmers, subsills, cripples, beam pockets, pocket-door trimmers and any short-wall studs. Mark each cut piece with a keel and place them at their proper location as soon as it's convenient.

• *Door Headers:* Start with the 3'0" door opening. A door header usually is 5 inches longer than the door size to allow 3" for trimmers, 1½" for the casing and ½" for squaring the frame. (A 3'0" door requires a 41" header; a 2'6" door, a 35" header; and a 2'4" door, a 33" header.)

Inspect one end of the header stock to see that it's square and flat, lay off 41" and mark it with the framing square, then cut it with a circular saw.

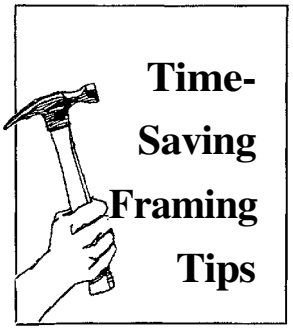
The 6'0" opening will rest on double studs on each side. Cut this header to 78", and cut the two 5"0" headers at 65". Mark them with a keel and distribute them around the perimeter.

• *Window Headers:* Windows always are measured horizontally first and then vertically. (A 5030 window is 5'0" wide and 3'0" high; a 3026 window is 3'0" wide and 2'6" high.) Assume these figures are the manufacturers' rough frame openings; you'll have to check yours.

A window header is 3" longer than the rough frame opening to allow for two 2x4 trimmers. In the case of the 8040 opening, double trimmers may be required, making that header 102" long.

• *Window Subsills:* Subsills are the same

Time-Saving Framing Tips



Misplaced hammers and disappearing chalk lines got you down? Here are a few ideas you may not have thought of to help you save time (or at least keep you from losing your cool) on your next framing job:

• That pretty blue chalk you've been using has no place on the framing site with red iron oxide, and fill your chalk box 7/8 full. Lines snapped with this stuff won't wash away when you sweep the floor or it rains (or when you drop your coffee).

• If your framing stock is larger than 2x6 (say 4x6 or 6x6), use a framing square instead of a combination square when drawing lines. Next time you're at the hardware store, check all the combination squares against a framing square, and you'll see why.

• As a general rule, when measuring timbers, do it twice. Measure first from the left and then from the right. Always begin with the larger size on the list. If a mistake is made you can still use it for one of the shorter sizes and thereby save the day.

• Use 16d sinkers with a waffle head for framing. The hammer should weigh about 24 ounces. If the hammer is new or you've just had it re-waffled at the saw shop, beat it for a while on steel or concrete to take off the razor-sharp edges.

With one swing, the nail should be set into the plate; the next blow should drive the nail home. (This is called "two-licking." Three-licking will get you a check within your first hour on the job, as it did with me on my first framing job.)

• When you're ready to start two-licking, open the keg and grab a handful of nails. Gather them like sticks, dropping the ends against your other palm. Now there are heads at both ends, but not for long.

With the thumb and forefinger of each hand, you can easily separate them into two groups (heads up and heads down). *Put them all in one direction in your pouch.* Repeat this a couple of times until your pouch is almost full, then get one more handful and move on to the studs.

• When you run out of sinkers, leave your hammer at that spot with the handle sticking up. Then go get more nails. You won't have to look for your place (or your hammer) on the way back or miss some nailing.

• Everyone makes mistakes (as in nails placed off center, for which you use your cats-paw or "gooney spoon" to pull them out). Stanley Tools makes an excellent nail puller (No. 55-035) with an offset claw on either end—one at 90 degrees and one at 30 degrees. You'll really appreciate the claw at the long end when the stud spacing is close and you can't get at a nail with the short end.

• There should be one let-in brace for every 25 linear feet of wall; 45 degrees is their minimum angle, while 60 degress is the maximum. With 16" spaces, the brace should cover five spaces and go from the rafter plate to the sole plate, slanting up and out toward the upper corners of the wall.

To cut a let-in brace, lay a piece of 1x4 in the correct position on the wall (after you've checked that the wall is square, of course). Set your saw to 1½" deep and cut along one edge of the brace and then the other. The sole plate of the saw will ride along on top of the 1x4. Cut the ends off to the correct shape as you pass with the saw. If you work carefully, the brace will fit nice and tight.

Now move the brace to the side to make the bottom cut (¾" deep). This is a dangerous cut that requires a lot of practice; get someone to show you how it's done the first time around.

Place the let-in brace into its channel and nail it to the sole plate with 8d sinkers. At each stud and the top plate, start (just start) two nails into the 1x4. Drive a nail toward the upper part of the brace and bend it over to hold the 1x4 in place while raising the wall. (The brace will be nailed in later.)

• Before you can lift a wall, you have to place a block under the rafter plate about every 10 feet so that you can get your fingers underneath it. To do this, place a 2x4 scrap on its edge against the rafter plate, then drive your hammer claws into the plate and lift up the wall. The scrap piece will fall under the rafter plate and hold up the wall.

• Just because you need an eight-foot level doesn't mean you have to buy one of those expensive jobs that you carry in a glass case and certainly don't want to drop.

Instead, go to the scrap yard and get a 20-foot piece of I-beam or channel aluminum, and cut it into an eight-foot level, a four-foot level and a 6'6" level for door trimmers. Use a torpedo placed against its side, and you've got it made. (Don't buy a torpedo with an exposed bubble, though—the lines wear off.)

The aluminum I've been kicking around on jobs for the past 10 years has held up well. Occasionally I buy a new torpedo and suddenly have four brand new levels to use—and at great prices, too. And you can always make a pouch for the torpedo out of scrap leather and rivets so you can keep it by your side. ■

—Marshall Gross

size as the rough fame openings. Since openings wider than 6' require double sills, cut two 8' subsills for the 8040 window. Cut the remaining subsills, mark them with a keel and distribute them around the foundation.

• *Door Trimmers:* Check the floor schedule. Here it calls for carpeting over the platform. Fig. 4 shows an 80 3/8" trimmer set on the sole plate, which allows 80" for the door, ¾" for the casing, ½" for leveling, and 5/8" for the carpet. Cut 10 trimmers for the five doors.

• *Window Trimmers:* Fig. 5 shows 77 ¾" window trimmers for the 8040 opening. We've determined that this size also will work for the other openings. Cut and mark the eight trimmers, and distribute them beside the foundation near each opening.

Windows always are measured horizontally first and then vertically; a 5030 window is 5'0" wide and 3'0" high. Assume these figures are the *manufacturers'* rough frame openings; you'll have to check yours.

• *Cripples:* Fig. 5 shows two methods of header framing. One requires no cripples above the header; the other requires 5" cripples. For the top, cut either eight cripples or build a solid header. At the bottom, the 4'0" opening with a double subsill requires a 26 ¾" subsill cripple. Cut eight of them.

You can start making a cripple cutting list by checking the window schedule for rough openings, the elevation drawings for placement and the roof plan for the size of the bearing-wall header.

Step 4: Stud Layout

At the end of step two (plating), all of the exterior and partition plates could be found on the platform as shown in Fig. 2.

Check plate *A-B*. The edge of the sole plate should be sitting at the chalk line, and the 3½" marks at each end should be right on the chalk marks of the perpendicular walls. Extend these marks to the top plate.

With the combination square set at 3½", mark the position of the two snap lines for wall *J* along the bottom of the sole plate. Extend these marks across the 1½" edges of the two plates. With the keel, mark "DN" between the marks to indicate a stud laid at the bottom of the channel, and place an "X" to indicate a stud on the outside of the marks. Wall *J* will frame in the large area toward *H*.

The center of the channel for wall *I* will be marked "DN," but the center of the channel for wall *D* will be marked "UP." Channels on exterior walls usually will be marked "DN." The channel on wall *D* will be solid. Four studs will provide the best backing.

Next, lay out the door opening on wall *A-B*. The floor plan shows the door centered, so measure the space between *C* and *J* and mark the center. Lay out 30" to each side of this center mark.

While the tape is out, also place marks at 31½" and 33", and draw these lines across both plates. Using the keel, mark "T" for trimmer and "K" for king stud on each plate in the eight squares.

Now mark off the window opening *A* according to the floor plan. Lay out the rough opening distance first, then make two more marks on each side for the eight "T" and "K" spaces.

Notice that wall *A-B* goes through on both ends, as does *F* and *G* and one side of *C* and *K*. Mark off for corner framing at these points.

Fig. 6 shows two types of corners. In 6A, three pieces of scrap are nailed between the studs at the top, bottom and middle of the space to give a strong corner and allow plenty of nailing surface for the exterior siding. This type will be used at *A*, *B*, *C*, *F* and *G*.

Wall *K* will use the type of corner illustrated in 6B. Mark three "Xs" on each plate at the end of *A* and of *B*. At the middle "X," simply put three pieces of scrap, each of which is about two feet long.

The exterior siding of this house will be plywood, so studs will have to be laid out on 16" centers. Hook the tape over the edge of the plate and stretch it down the plate, then, starting at 15¼" , make a mark every 16 inches (at 31¼", 47¼", 63¼", etc.). Draw a line across both plates at these marks.

Anywhere within the door or window opening, place a "C" for cripple on the running end of the tape (in this case, to the left of the mark). Place an "X" at the other marks to indicate studs, and wall *A-B* is completed.

On wall *H*, as always, first make sure it is directly on the lines, then mark the partition. Place an "X" at each end of this wall. There is always a stud at the end of the plate where a wall does not go through, so walls *H*, *I*, *J*, *L*, *D* and *E* all will have one stud at each end. Walls C and K will have a corner marking at one end and a single stud at the other.

When you begin the stud layout of wall *H*, remember that the plywood must extend 3½" beyond the end of the wall. Stretch your tape along the plate and lock the blade. Go to the beginning of the plate and pull the 3½" mark of the tape directly over the edge of the plate.

Proceed as before, marking every 16 inches. There are no cripples in this wall, so mark an "X" on the up side of each mark. Continue laying out all the other plates.

Now most of the plates will be moved off the platform so that framing can begin. Exterior walls that go through will be framed first; therefore, walls *A-B* and *F-G* will remain on the platform. Slip the other exterior walls (*C*, *E* and *H*) off the platform.

Mark an "I" on the *I* plate and on the platform beside it with the keel, then do the same with *J*, *K*, *L* and *D*. Next, move these plates off the platform, leaving a clear deck except for *A-B* and *F-G*. Now you're ready to begin framing.

Step 5: Framing

Begin with *A-B*, the longest exterior wall; *F-G* will follow. *H* is the next biggest exterior wall and must be famed before *I* is in the way. *C*, *D* and *E* will follow in that order to tie the exterior walls together. *K* and *L* can be done anytime, since the room is big enough to frame them in, but *J* must be done before *I*.

Start by "stacking" the wall. Get an armful of studs. Slip each end against an "X" on the sole plate, leaving the stud on edge. Step back so that you can deal with the next stud out against the next mark. At the channel marking for wall intersect *J*, a stud will be laid flat with one at either side laid on edge.

Pull the 7d duplex nails from the plates. Pick up the top plate and move it to the other end of the studs. When you split the plates, be sure not to turn the top plate over.

Now you're ready to start nailing. It doesn't matter which end you start at, but put two sinkers in each 2x4 sill and three in the 2x6 walls. The edge of the stud goes right at the line, and the meat of the stud goes over the "X."

Go through and nail the top and bottom of each stud. Keep the channel tight, but don't nail off its length or the corners until the wall is square Stick your toe down in the channel so the stud will be flat on that side.

Now you can stack the trimmers, headers, cripples and subsill. Door trimmers are tacknailed. Drive a 16d nail near the top and near the bottom, but leave the nailheads up; the carpenter setting the doors can then plumb these trimmers. Use five 16d sinkers to nail headers to the king studs.

Window trimmers, channels and corners have five sinkers spread over their length. Set the sole plate on the snap line, and check that the wall is square before nailing these parts off.

At the window subsill cripple, keep nails from the center of the cripple area, as the electrician will be drilling here to run the wiring. Fasten small cripples above a header with 8d sinkers.

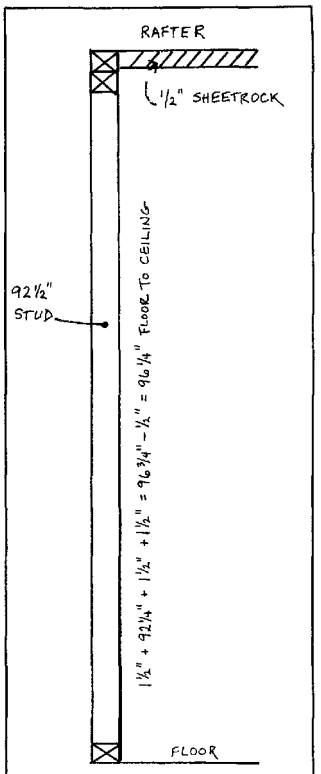


Fig. 3
End View, Wall Height

Snap a line across the studs four feet from the sole plate to mark where the fire blocks will go. Fire blocking must be measured off along the spaces at either plate—never in the center at the snap line.

After cutting the fire blocks, walk along the wall starting at one end, nailing only one end of each block. At the other end, turn around and come back to finish the nailing. Two 16d sinkers in each side are plenty. The blocks don't have to be staggered.

Next, lay the rafter-plate stock on edge directly on top of the top plate. Where a wall goes through, the rafter plate will be 3 5/8" back from the end of the wall. Break the rafter plate over a header or a stud and at least four feet from any top-plate joint.

The rafter plate must be broken at the channel for *J*. Hold the plate back a little to allow room for plumbing wall *J*. Cut the rafter plate and nail it on, using two 16d sinkers at each end and four where it crosses a joint in the top plate. Place nails on each stud high first and then low on the 3½" surface. Keep all nails above the studs—not in the spaces, because there will be some drilling there.

In this case, the plywood exterior siding acts a shear panel, so let-in braces aren't necessary.

Go to the door where the sole plate protrudes into the door space, and with a sharp swing, drive the claws of your hammer into the bottom of the sole plate. Now you have a "handle" to lift up the wall while you cut the sole plate off flush at the trimmer. Repeat on the other side.

If the wall is to have the window and siding installed, do it now; otherwise, get ready to raise the wall. Drive a stake into the ground opposite the door and window fames, and lay some long stock by them for braces. Finally, install a sill seal—probably caulking—between the snap line and the edge. Find lots of help and raise the wall.

Rather than nailing off the sole plate right away, leave the *A* section of the wall cantilevered over the edge of the platform until *H* is famed and standing up.

Things are beginning to look real sharp.

Step 6: Plumb and Line

Plumb-and-line work can be done with string, a plumb bob, a transit or a level; I prefer the level.

Plumb and level your exterior walls carefully, double-checking your work as you go. As you set braces and get things square, begin adding bracing and then cross-bracing so that the walls won't move when you begin joisting. You'll have to nail off the sole plate, the corners, partitions, let-in braces and the rafter plate as you go. Take your time and don't rush.

Step 7: Pickup Work

Pickup work usually begins after the faming is complete. Probably the most forgotten thing is straightening studs.

Place your eight-foot level against the studs near the bottom of the wall. As you move the level up, mark the points where a stud sticks out of the wall or isn't flush. (But first check the top and bottom plates to make sure the stud was nailed flush to begin with.)

The first step in straightening a stud is marking the maximum point of the crown. (To find the crown, lay your eight-foot level on the edge of the stud and rock it from top to bottom.) Center cut a 3½" notch 1½" deep, then cut a scrap piece of 2x4 that will fit into the notch and against the studs to either side. (See Fig. 7.)

Another method involves cutting into the stud on the opposite side of the crown point. Push on the crown point to open up the cut, then put a shingle into the notch until the stud remains straight. (You may need to install a gusset on the side of the stud as well.)

A sharp hatchet is handy to knock off crowns. When the studs are really a mess, an electric planer works well—but watch out for nails.

Backing is the next big item in pickup work. The joisting will be running front to back, which means that walls *C*, *L*, *E*, *J* and *H* will be parallel to the joists. There will be nothing to nail the ceiling to at these points, so nail a 2x6 on top of *E*, *L* and *J* to provide the necessary backing. On *C* and *H*, a 2x4 will do.

If *F* was laid out incorrectly, you won't have any interior corner backing where *F* meets *E*,

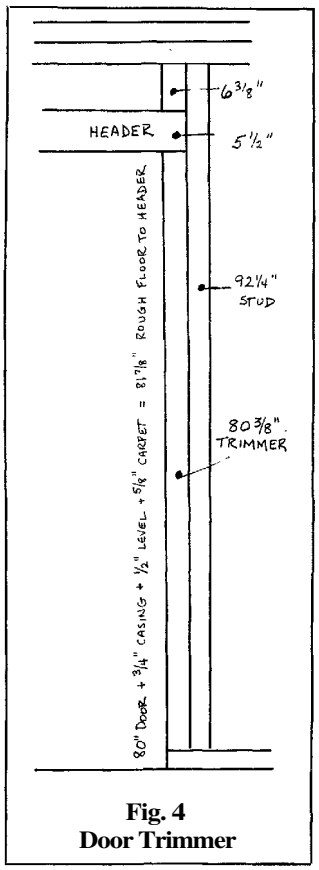


Fig. 4
Door Trimmer

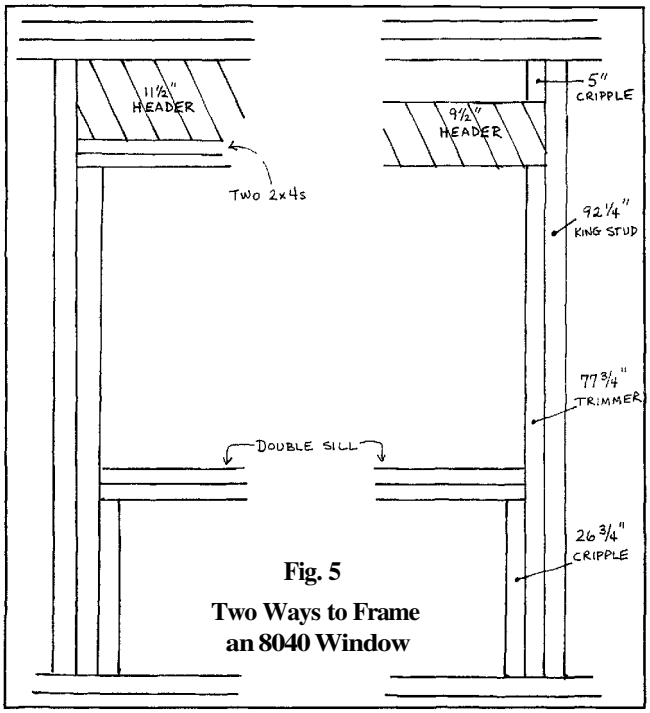


Fig. 5
Two Ways to Frame an 8040 Window

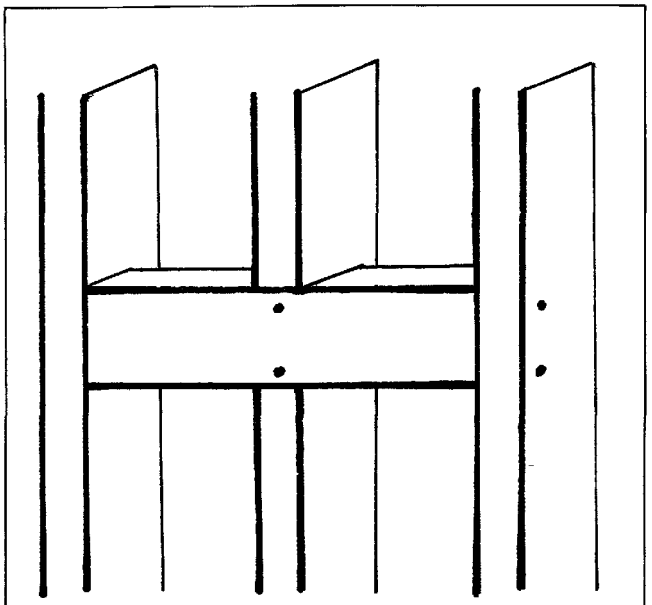


Fig. 7
Straightening Studs

which is a 2x6 plumbing wall. Nail a 2x4 against the 2x6 of wall *E*.

Check all trimmer-header joints. If there's a space, drive in a wedge to fill it in.

Another reason for leaving the door trimmers loose is to allow the sole plate to be nailed down directly under the trimmer. Often one side of a doorway is quite loose. The wall *K* opening already is under suspicion. Check each side to see that it's solid.

Consider the bathroom door. If the layout person was good, there's a double stud on the latch side. Add blocking through the next two openings for stiffness; it really helps.

Another reason for leaving the door trimmers loose is to allow the sole plate to be nailed down directly under the trimmer. Often one side of a doorway is quite loose.

In the bathroom, add backing for the tub or shower pan, a toilet-paper holder, towel bars and the sink. Add a 2x4 dam in front of the shower pan. Frame in a spot for the medicine cabinet and perhaps a recessed light—check the electrical plan.

Block off the space at freeze vents so they won't be sealed off by ceiling insulation. A cut-out piece of plywood nailed against the bottom of the rafters works well.

The pickup person must lay in fire blocking in the stair wells, as well as frame an attic crawl space and build a cover. Make the attic opening 22" by 30" and place it to allow at least 30" of headroom.

After this, the pickup work that remains depends on the house involved. For example, there may be a dropped ceiling in the kitchen that holds recessed lighting. Wiring raceways, water-heater platforms, duct frames, draft stops, cabinet backing, fireplace platforms, earthquake proofing, header ties and soffit construction are among the other things required of the pickup person.

With the pickup work behind you, you're ready to proceed with the interior and exterior finish. Congratulations on a classy framing job. You're off to a great start. ■

Carpenter and teacher Marshall Gross lives in Cottonwood, Idaho. He is the author of Roof Framing *(1984), which was reviewed in the May 1985 issue of* NEB.

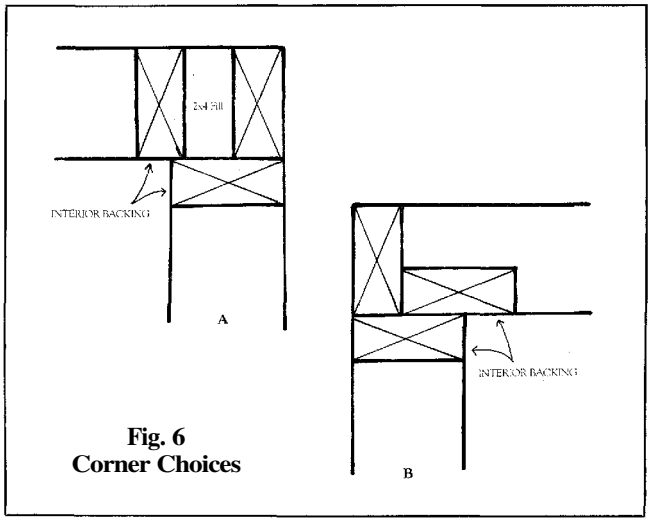


Fig. 6
Corner Choices